

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)



(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P0810	FOR FURTHER ACTION	See Form PCT/IPEA416
International application No. PCT/GB2004/000151	International filing date (day/month/year) 16.01.2004	Priority date (day/month/year) 18.01.2003
International Patent Classification (IPC) or national classification and IPC H05B3/74		
Applicant CERAMASPEED LIMITED et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ sent to the applicant and to the International Bureau a total of 11 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 13.08.2004	Date of completion of this report 04.05.2005
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International application No.
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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

4-6, 8-13 as originally filed
1-3, 7 filed with telefax on 13.08.2004

Claims, Numbers

1-36 filed with telefax on 13.08.2004

Drawings, Sheets

1-2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-36
	No: Claims	
Inventive step (IS)	Yes: Claims	1-36
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-36
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: EP-A-0 810 814 (EMERSON ELECTRIC CO) 3 December 1997 (1997-12-03)
- D2: US-B1-6 229 119 (MANNUS SIEGFRIED ET AL) 8 May 2001 (2001-05-08)
- D3: US 2002/121510 A1 (BELZ BERNHARD ET AL) 5 September 2002 (2002-09-05)
- D4: US-A-4 508 961 (MCWILLIAMS JOSEPH A) 2 April 1985 (1985-04-02)
- D5: WO 03/003793 A (MCWILLIAMS KEVIN RONALD ; CERAMASPEED LTD (GB)) 9 January 2003 (2003-01-09)

The document D1, which is considered to represent the closest prior art to the subject-matter of claim 1, shows a heater comprising an temperature-responsive device from which the subject-matter of claim 1 differs in that in claim 1 an electrical parameter changes as a function of temperature and an associated electrically insulating carrier for attachment of the terminal regions of the heating element.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as providing an electric heater assembly which provides easier electrical connection with both the temperature-responsive device and the heating elements.

The solution to this problem, proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons: The known heater in D1 discloses temperature-limiting devices which utilise a thermal cut out switch to interrupt the power supply to the heating elements of the heater. The terminal regions of the heating elements are directly electrically connected to a cut-off switch of the temperature limiting device which acts to disrupt current flow to the heating elements if an over-temperature condition occurs. There is no disclosure or teaching in D1 that an electrically insulating carrier member secured to an elongate member supporting a temperature-responsive device could be used. There is also no teaching of the insulating carrier member for attachment of the terminal regions of the heating element. The

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insulating carrier member being secured to the elongate member at a location of the periphery of the heater and having conductive elements at opposite side edges for connection to the heating element, provides a new construction of the assembly more simple than in the prior art, allowing an easy electrical connection of the controller with both the temperature-responsive device and the heater.

Claims 2-36 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

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ELECTRIC HEATER

This invention relates to an electric heater provided with a temperature-responsive device, for example an
5 electric heater for use in a cooking appliance, such as a cooking hob having a glass-ceramic cooking surface.

It is well known to provide a temperature-responsive device for controlling operation of an electric heater.
10 Such an electric heater is typically arranged for location behind a surface to be heated, such as a glass-ceramic cooking surface, and generally comprises a dish-like support having therein at least one electric heating element. In particular, the temperature-responsive device
15 comprises an electrical component having an electrical parameter which changes as a function of temperature and which is supported by an elongate member which is arranged to extend at least partly across the heater from a periphery thereof. The electrical component provides an
20 electrical output which changes as a function of temperature, the electrical component being electrically connected to an electronic controller, such as a microprocessor-based controller, to control energising of the electric heater from a power supply.

25

In particular, the electrical component comprises an electrical resistance temperature detector, such as a platinum resistance temperature detector, whose electrical resistance changes as a function of
30 temperature. The electrical component may be supported inside a tube, such as of metal or ceramic, or on an elongate beam, such as of ceramic material.

It is known to provide a terminal block externally on the
35 dish-like support of the heater. Such terminal block is

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remote from the temperature-responsive device and is connected inside the heater to terminal regions of the heating element or elements. External leads are arranged from the terminal block to the power supply, suitably by way of the electronic controller.

It is also known to provide direct electrical connection between terminal regions of a heating element and connecting elements on a temperature-limiting device, such connecting elements being accessible in the region of a front face of a switch housing of the temperature-limiting device adjacent to the heater. In this known arrangement, the temperature-limiting device comprises a differentially-expanding rod and tube assembly, which extends at least partly across the heater from the housing and operates one or more switch means located in the housing.

It is an object of the present invention to provide an electrical connection between terminal regions of a heating element and electrical conducting elements on a temperature-responsive device of an electric heater which overcomes or at least ameliorates disadvantages of the above arrangements.

25

According to the present invention there is provided an electric heater adapted for location behind a surface to be heated and comprising a dish-like support having therein at least one electric heating element having a first terminal region and a second terminal region and a temperature-responsive device, wherein the temperature-responsive device comprises an electrical component having an electrical parameter which changes as a function of temperature and arranged to be supported inside the heater by an elongate member which is adapted

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to be secured to the heater and to extend at least partially across the heater from a region externally of the periphery thereof, an electrically insulating carrier member being secured to the elongate member at a location
5 externally of the periphery of the heater, the carrier member having a first side edge and a second side edge laterally disposed at opposite sides of the elongate member and provided with a first electrically conductive element and a second electrically conductive element
10 accessible at the opposite side edges of the carrier member for electrical connection to the first and second terminal regions respectively of the at least one electric heating element.

15 Electrical connection of the first and second electrically conductive elements to the respective first and second terminal regions of the at least one heating element may be by means of direct contact between the electrically conductive elements and the terminal
20 regions.

The first and second terminal regions of the at least one heating element may extend through apertures in the dish-like support for electrical connection to the first and
25 second electrically conductive elements.

The first and second terminal regions of the at least one heating element may be electrically connected to the first and second electrically conductive elements by
30 welding.

At least one of the first and second electrically conductive elements may be provided with a portion selected from a strip-like portion and a flanged portion

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For a better understanding of the present invention and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:

5

Figure 1 is a plan view of an arrangement of part of an electric heater according to the present invention provided with an embodiment of a temperature-responsive device; and

10

Figure 2 is a plan view of a modification of the arrangement of Figure 1.

Referring to Figure 1, an electric heater 2 is arranged
15 for location beneath a surface 4 to be heated. The surface 4 may be a cooking surface and may comprise glass-ceramic material.

The heater 2 comprises a dish-like support 6, such as of
20 metal, containing a layer 8 of thermal and electrical insulation material, such as microporous thermal and electrical insulation material. A peripheral wall 10 of thermal insulation material is provided in the dish-like support 6 and contacts the underside of the surface 4 to
25 be heated.

At least one radiant electric heating element 12 is arranged inside the dish-like support 6. As shown in Figure 1, heating element 12 comprises a corrugated metal
30 ribbon arranged upstanding on edge in the dish-like

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CLAIMS

1. An electric heater (2) adapted for location behind a surface to be heated and comprising a dish-like support
 5 (6) having therein at least one electric heating element (12) having a first terminal region (12A) and a second terminal region (12B) and a temperature-responsive device (14), characterised in that the temperature-responsive device comprises an electrical component (18) having an
 10 electrical parameter which changes as a function of temperature and arranged to be supported inside the heater (2) by an elongate member (16) which is adapted to be secured to the heater (2) and to extend at least partially across the heater (2) from a region externally
 15 of the periphery thereof, an electrically insulating carrier member (30) being secured to the elongate member (16) at a location externally of the periphery of the heater (2), the carrier member (30) having a first side edge (32) and a second side edge (38) laterally disposed
 20 at opposite sides of the elongate member (16) and provided with a first electrically conductive element (34) and a second electrically conductive element (40) accessible at the opposite side edges (32, 38) of the carrier member (30) for electrical connection to the
 25 first and second terminal regions (12A, 12B) respectively of the at least one electric heating element (12).

2. An electric heater as claimed in claim 1,
 characterised in that electrical connection of the first
 30 and second electrically conductive elements (34, 40) to the respective first and second terminal regions (12A, 12B) of the at least one heating element (12) is by means of direct contact between the electrically conductive elements (34, 40) and the terminal regions (12A, 12B).

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3. An electric heater as claimed in claim 1 or 2,
characterised in that the first and second terminal
regions (12A, 12B) of the at least one heating element
(12) extend through apertures in the dish-like support
5 (6) for electrical connection to the first and second
electrically conductive elements (34, 40).

4. An electric heater as claimed in any preceding
claim, characterised in that the first and second
10 terminal regions (12A, 12B) of the at least one heating
element (12) are electrically connected to the first and
second electrically conductive elements (34, 40) by
welding.

15 5. An electric heater as claimed in any preceding
claim, characterised in that at least one of the first
and second electrically conductive elements (34, 40) is
provided with a portion (36, 42) selected from a strip-
like portion and a flanged portion for securing to at
20 least one of the first and second terminal regions (12A,
12B) of the at least one heating element (12).

6. An electric heater as claimed in claim 5,
characterised in that the strip-like portion has a plane
25 thereof disposed in any desired orientation from a
vertical plane to a horizontal plane.

7. An electric heater as claimed in claim 5,
characterised in that the flanged portion has a wall
30 portion with a dependant laterally-directed ledge portion
(36A, 42A).

8. An electric heater as claimed in any one of claims 5
to 7, characterised in that at least one of the first and
35 second electrically conductive elements (34, 40) has the

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portion (36, 42) extending in a direction towards the heater (2) and at a predetermined angle relative to a rim of the dish-like support (6).

5 9. An electric heater as claimed in claim 1, characterised in that at least one of the first and second electrically conductive elements (34, 40) is arranged for electrical connection to a terminal region selected from the respective first and second terminal
10 regions (12A, 12B) of the at least one heating element (12) by way of at least one electrically conductive link (56).

10 An electric heater as claimed in claim 9,
15 characterised in that the at least one electrically conductive link (56) is of a form selected from wire and strip form.

11. An electric heater as claimed in claim 9 or 10,
20 characterised in that the at least one electrically conductive link (56) extends through apertures in the dish-like support (6) for electrical connection to the first and second electrically conductive elements (34, 40).

25
12. An electric heater as claimed in any one of claims 9 to 11, characterised in that the at least one electrically conductive link (56) is electrically connected to the first and second electrically conductive
30 elements (34, 40) by welding.

13. An electric heater as claimed in any one of claims 9 to 12, characterised in that at least one of the first and second electrically conductive elements (34, 40) is
35 provided with a portion (36, 42) selected from a strip-

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like portion and a flanged portion for securing to the at least one electrically conductive link (56).

14. An electric heater as claimed in claim 13,
5 characterised in that the strip-like portion has a plane thereof disposed in any desired orientation from a vertical plane to a horizontal plane.

15. An electric heater as claimed in claim 13,
10 characterised in that the flanged portion has a wall portion with a dependant laterally-directed ledge portion (36A, 42A).

16. An electric heater as claimed in any one of claims 9
15 to 15, characterised in that at least one of the first and second electrically conductive elements (34, 40) has the portion (36, 42) extending in a direction towards the heater (2) and at a predetermined angle relative to a rim of the dish-like support (6).

20
17. An electric heater as claimed in any preceding claim, characterised in that the first and second electrically conductive elements (34, 40) extend laterally at the first and second opposite side edges
25 (32, 38) of the carrier member (30).

18. An electric heater as claimed in any preceding claim, characterised in that the at least one electric heating element (12) is of corrugated ribbon form (12)
30 supported upstanding on edge in the dish-like support (6).

19. An electric heater as claimed in claim 18,
characterised in that at least one of the first and
35 second terminal regions (12A, 12B) of the at least one

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electric heating element (12) of corrugated ribbon form (12) is connected directly to at least one of the first and second electrically conductive elements (34, 40) and has an orientation substantially the same as that of the
5 at least one electric heating element (12) as supported in the dish-like support (6).

20. An electric heater as claimed in claim 18, characterised in that at least one of the first and
10 second terminal regions (12A, 12B) of the at least one electric heating element (12) of corrugated ribbon form (12) is connected directly to at least one of the first and second electrically conductive elements (34, 40) and is twisted through an appropriate angle for connection to
15 at least one of the first and second electrically conductive elements (34, 40).

21. An electric heater as claimed in any preceding claim, characterised in that the first and second
20 electrically conductive elements (34, 40) comprise metal.

22. An electric heater as claimed in claim 21, characterised in that the metal is selected from stainless steel and nickel-plated steel.

25

23. An electric heater as claimed in any preceding claim, characterised in that the first and second electrically conductive elements (34, 40) are provided with means for electrical connection thereof to external
30 lead wires (50).

24. An electric heater as claimed in claim 23, characterised in that the means for electrical connection comprises terminal members (44, 48).

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25. An electric heater as claimed in claim 24, characterised in that the terminal members (44, 48) are of a form selected from tab and spade form.

5 26. An electric heater as claimed in any preceding claim, characterised in that the carrier member (30) comprises ceramic material.

10 27. An electric heater as claimed in any preceding claim, characterised in that the electrical component (18) is provided with electrical leads (20) extending therefrom and emerging from the elongate member (16) at the region of the heater (2) externally of the periphery thereof.

15

28. An electric heater as claimed in claim 27, characterised in that the electrical leads (20) are adapted to be electrically connected to an electronic controller (26) which is adapted to provide controlled
20 electrical connection between a power supply (28) and the first and second electrically conductive elements (34, 40).

25 29. An electric heater as claimed in claim 28, characterised in that the electronic controller (26) is a microprocessor-based controller (26).

30 30. An electric heater as claimed in any preceding claim, characterised in that the electrical component (18) comprises a device whose electrical resistance changes as a function of temperature.

31. An electric heater as claimed in any preceding claim, characterised in that the electrical component

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(18) comprises an electrical resistance temperature detector.

32. An electric heater as claimed in claim 31,
5 characterised in that the electrical resistance temperature detector is a platinum resistance temperature detector.

33. An electric heater as claimed in any preceding
10 claim, characterised in that the elongate member (16) comprises a tube inside which the electrical component (18) is arranged.

34. An electric heater as claimed in claim 33,
15 characterised in that the tube is of a material selected from metal and ceramic.

35. An electric heater as claimed in any one of claims 1
to 32, characterised in that the elongate member (16)
20 comprises a beam on a surface of which the electrical component (18) is provided.

36. An electric heater as claimed in claim 35,
characterised in that the beam is of ceramic material.

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